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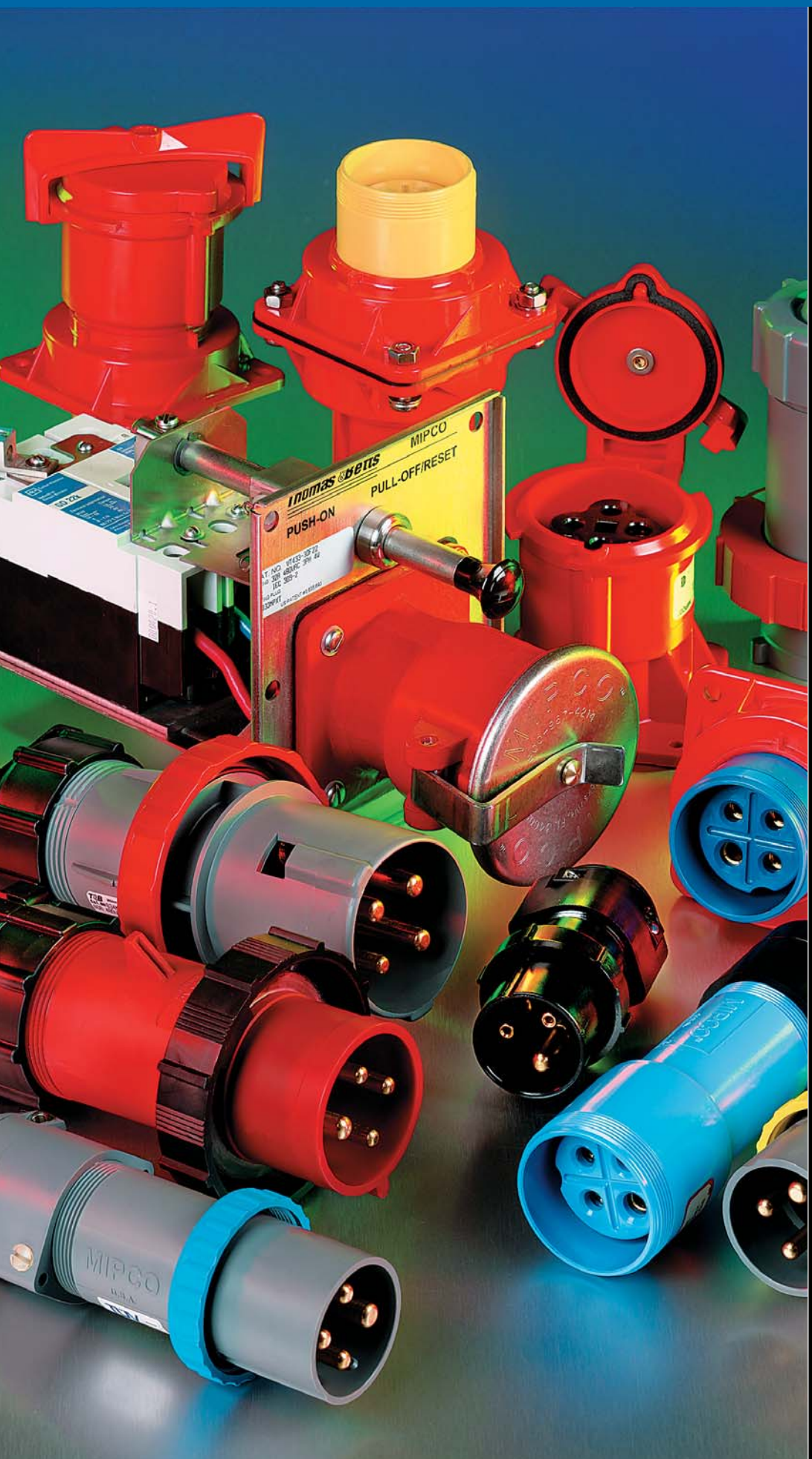

Mipco™

Plugs, Connectors & Receptacles for the Refrigerated Container Industry

T&B ENGINEERED

Effective January 2002

Mipco™

Overview

Mipco™ Sets the Standards

In today's competitive global markets, reliable equipment is essential to protect perishable cargoes from loss. Mipco™ responds to our customers with world-class quality products to meet their special needs. Mipco™ is the recognized leader in refrigerated container industry power interconnections and systems.

Mipco™ constantly monitors and updates products to meet the ever-changing demands of the market. We recently re-engineered our Interlocked Reefer Power Outlet from top to bottom, offering the ultimate in safety, reliability and durability. This new "Module" has a unique interlock mechanism that ensures plugs cannot be removed while under load.

Our customers benefit from the convenience of "one stop shopping" in our expanded line of products. Contact T&B's Customer Service Department for an authorized distributor in your area. Our worldwide distribution network stocks products to provide you with an immediate solution to your reefer needs.

Manufacturing Quality Systems
Certified to ISO-9001

On Ship, On track or Dockside…Worldwide

Mipco™

Standard Products

Plugs, Connectors & Receptacles.....2-5, 8, 11

Special Products 6-7, 9

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Interlocked Reefer Power Outlets.....12-18

Multi-Gang Enclosure Systems.....19

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Alternating Power Outlets (APO)...22-23

Replacement Items.....24

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Mipco™

Standard Products – Plugs, Connectors & Receptacles

Plug Into Mipco™ Power

Mipco™ plugs, connectors and receptacles are used extensively in ports, terminals, transport and shipboard applications to provide a safe, watertight electrical connection for refrigerated containers. Mipco construction and design benefits are a quality benchmark:

- **No corrosion:** aluminum receptacles are copper-free aluminum castings with a unique 2-layer electrostatic epoxy powder coat finish. Stainless steel and brass components are used extensively.
- **Tougher and better:** thermoplastic receptacle, connectors and plugs are made from Amtuf high abuse Nylon thermoplastic and DuraV high strength thermoplastic. Wide range chemical, UV withstand, impact and overall performance characteristics set the standard for construction.
- **Safety Listed and Approved:** We lead with safety in UL/CSA listings, approvals and certifications. "Recognized" or "non-listed" offshore supplier components just aren't the same.

The Mipco™ Advantage

Safety

- **Safety** ground pin makes first, breaks last for optimum operator safety.
- Internal O-ring seals provide **watertight integrity,** even without plug engaged or cap in place.
- Thermoset interiors provide the **safest insulation** under extreme conditions.
- Color-coded housings provide **easy identification** of mating components.

Durability

- Amtuf™ housings which provide three times the **impact and temperature resistance** of polycarbonate. Extremely resistant to oil, fuel, grease and most common solvents.
- Neoprene cable compression bushings with locking collars provide a **watertight, tug-proof connection.**

Reliability

- Solid brass contact sleeves with beryllium copper compression springs **minimize heat rise and corrosion.**
- Waterproof cable sealings and locking screw collars assure **waterproof connections.**

Easy Installation & Service

- Fast assembly and wiring with "drop-in" rear loaded interiors.
- A variety of optional bushing sizes available for plugs and connectors to ensure sealing to your cable.
- **Readily available service parts.**
  - Receptacle assembly
  - Circuit breaker assembly
  - Interior assembly
  - Linkage kits
  - Hardware kits
  - Flap cap / Screw cap assemblies

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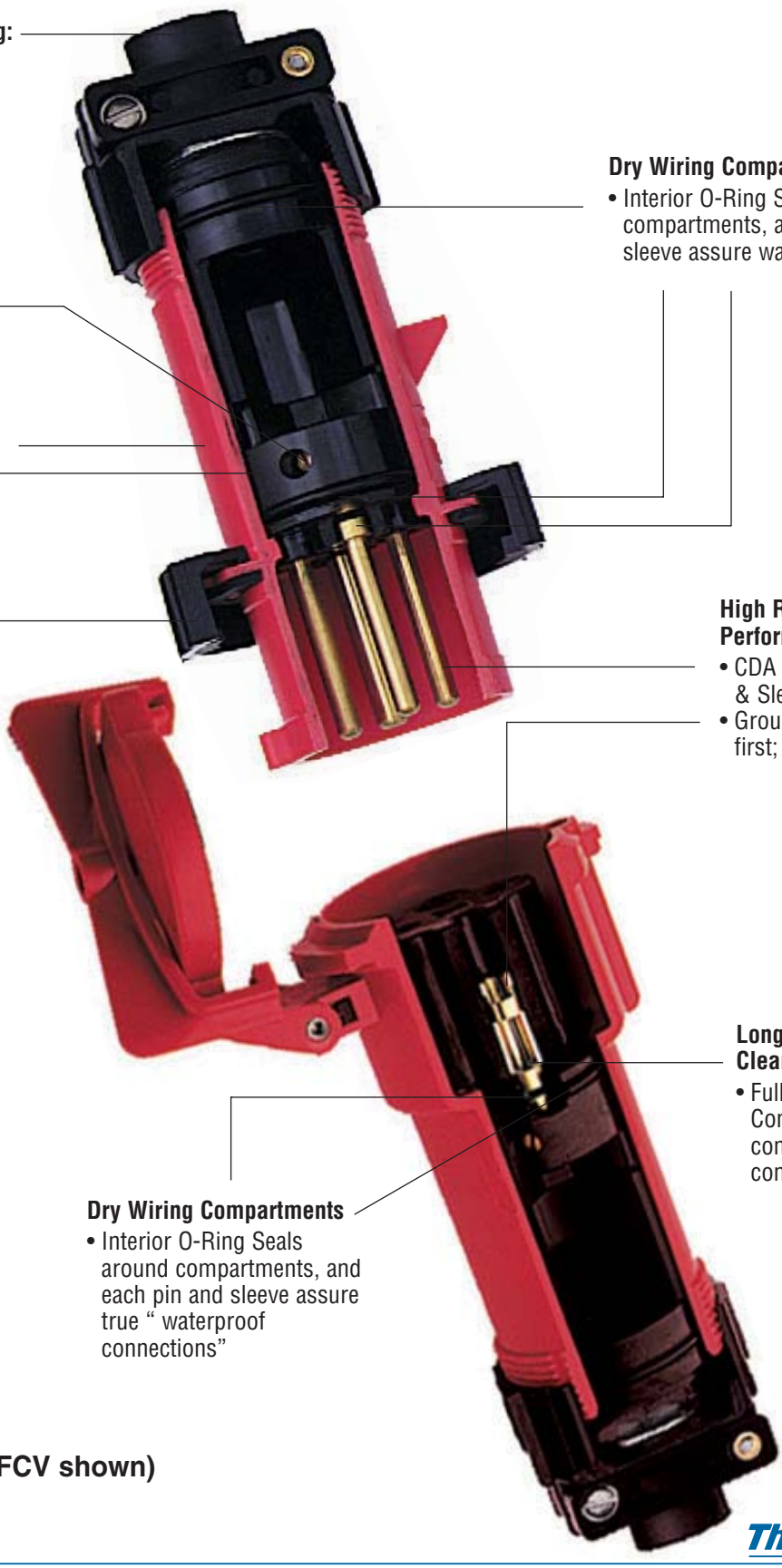
Standard Products – Plugs & Connectors

Waterproof Cable Sealing:
- Nut with Cable Locking Clamps
- Neoprene Compression Bushing Cable Sealing / Locking System

Fast, Easy, Rear Load Wiring & Assembly:
- Terminal Set Screws

The Most Durable Materials Available
- AMTUF™ High impact housings
- Thermoset Interiors

Waterproof Locking Connections:
- Locking Screw Collars with gasket seals
- IP67 minimum



Dry Wiring Compartments
- Interior O-Ring Seals around compartments, and each pin and sleeve assure waterproof connections

High Reliability, High Performance Connections
- CDA 360 Solid Brass Pin & Sleeve
- Ground contacts make first; break last

Long Lasting Self Cleaning Connections
- Full Round Pin & Sleeve Contacts for maximum contact area and coolest connection

Dry Wiring Compartments
- Interior O-Ring Seals around compartments, and each pin and sleeve assure true " waterproof connections"

(333MPXT and 333FCV shown)

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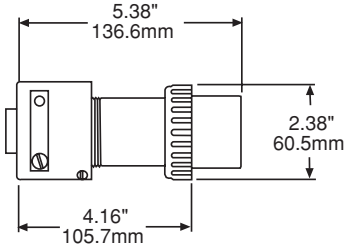
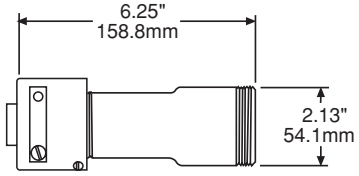
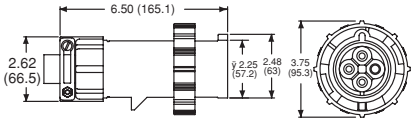
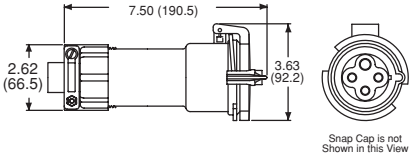
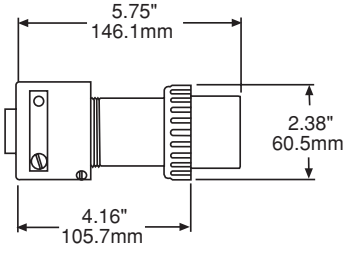
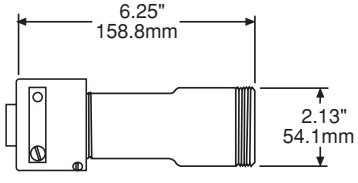
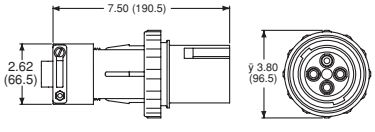
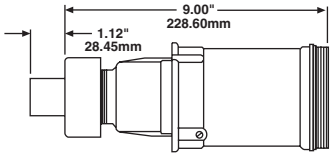
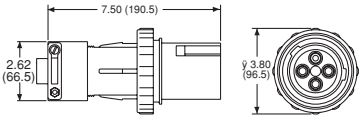
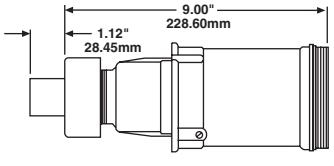
Standard Products – Plugs, Connectors & Receptacles

Male Plugs

Female Connectors

Cat. No.	Dimensions	Rating	Cat. No.	Dimensions
334MPXT		**30 AMP 250VAC** 60Hz 3P4W	**334FC•**	
333MPXT		**32 AMP 380/440 VAC** 50/60Hz 3P4W IEC 309-2 (480) VAC-USA)	**333FCVS**	
534MPXT		**50 AMP 250VAC** 60Hz 3P4W	**534FC•**	
634MP2XT		**60 AMP 250VAC** 60Hz 3P4W	**634FC2•**	
634MP4XT		**60 AMP 480VAC** 60Hz 3P4W	**634FC4VS**	

Additional bushing sizes available for plugs and connectors to ensure sealing to your cable.
See page 7 for ordering information.

• Polycarbonate housing.

▲ DuraV™ Housing, UL94V-0 Flame rated.

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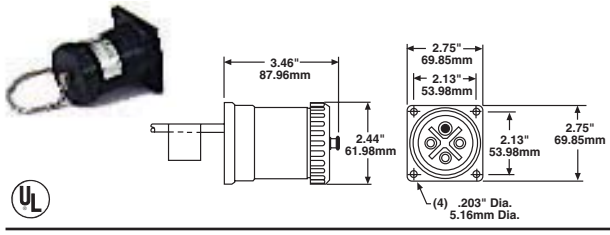
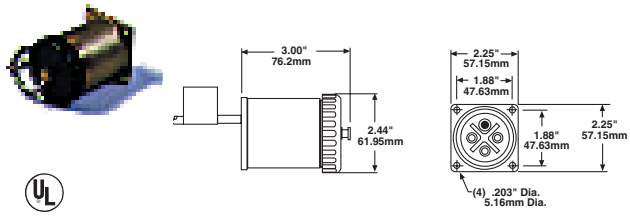
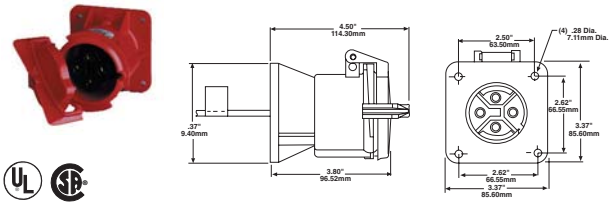
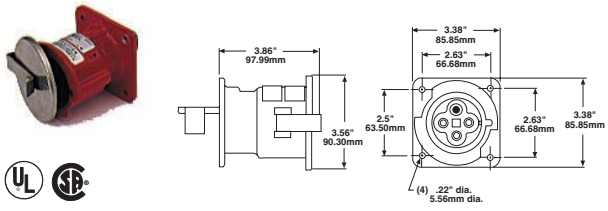
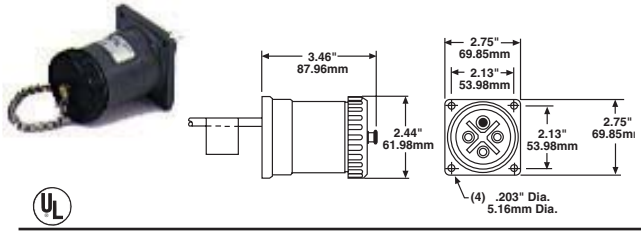
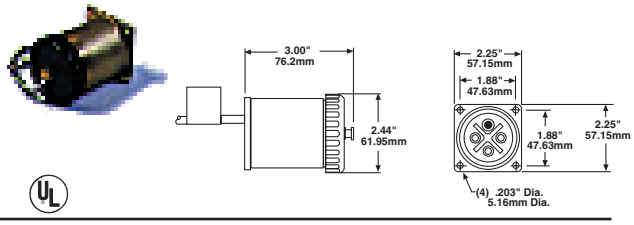
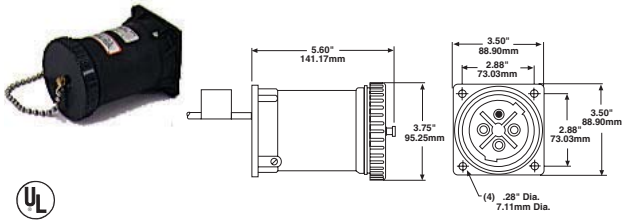
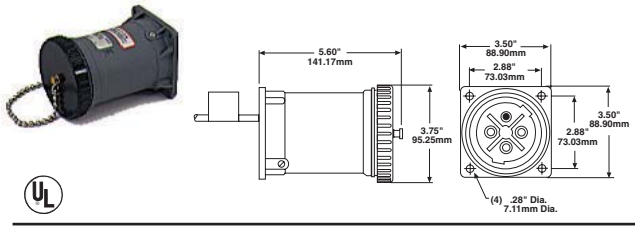
Standard Products – Plugs, Connectors & Receptacles – Ordering Information

Non-Metallic Male Plugs

Metallic Female Connectors

Cat. No.	Dimensions	Rating	Cat. No.	Dimensions
3034FRXTS		**Rating 30 AMP 250VAC** 60Hz 3P4W	**3034FRS**	
3334FRVS▲		**32 AMP 380/440 VAC** 50/60Hz 3P4W IEC 309-2 (480) VAC-USA)	**3334FRF**	
5034FRXTS		**50 AMP 250VAC** 60Hz 3P4W	**5034FRS**	
6234FRXTS		**60 AMP 250VAC** 60Hz 3P4W	**6234FR**	
6434FRXTS		**60 AMP 480VAC** 60Hz 3P4W	**6434FR**	

For All Receptacles; Flap Cap, order using suffix "F". Example 3334FRVF.
Screw Cap, order using suffix "S". Example 3034FRXTS.

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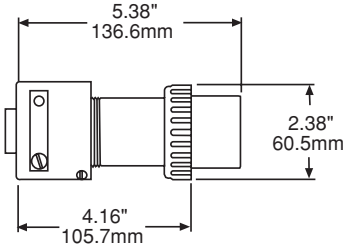
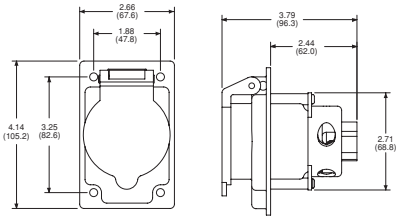
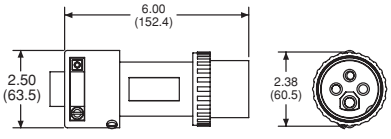
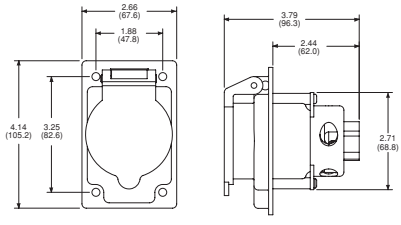
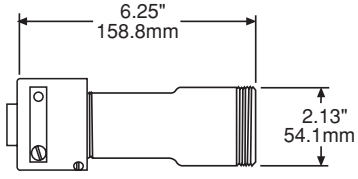
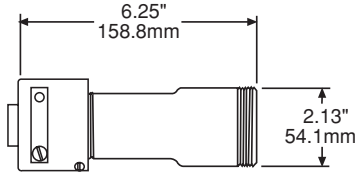
Special Products: Reversed Contacts Service – 30A and 50A, 250VAC

Female Plugs

Cat. No.	Dimensions	Rating
334FP		**30 AMP 250VAC,** 60Hz 3P4W
334MR		
534FP		**50 AMP 250VAC,** 60Hz 3P4W
534MR		

Male Connectors

Cat. No.	Dimensions
334MC	
534MC	

Note: Many additional bushing sizes available; see page 8.

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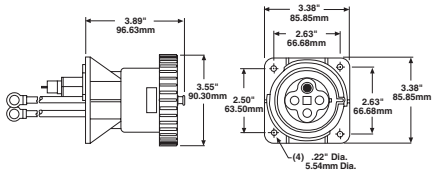
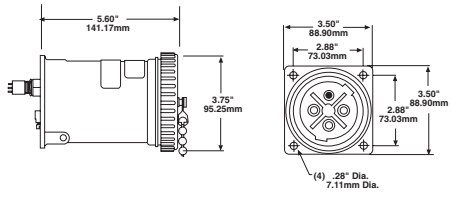
Special Products – Fixed Receptacles with Monitor Switches

These receptacles include a micro switch mounted at the rear of the interior. The switch is mechanically activated by plug (ground pin) insertion. Applications include electrical interlocking, control circuits and safe switch or monitor systems. (Micro switch is a separate circuit.)

Ordering Information

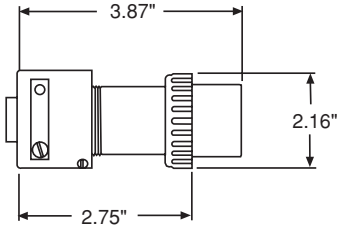
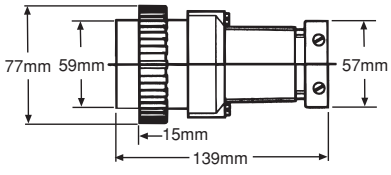
Cat. No.	Dimensions	Rating
3334FRVSMS▲*		**32 AMP 380/440VAC** 50/60Hz, 3P4W IEC309-2 (480) VAC-USA)
6234FRMS*		**60 AMP 250VAC** 60Hz 3P4W

* Flap Cap also available.
Polycarbonate Housing used on 6234FRMS.
▲DuraV™ Housing Used for 3334FRVSMS, replaces 3334FRPSMS.

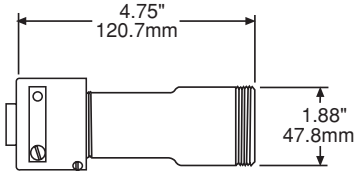
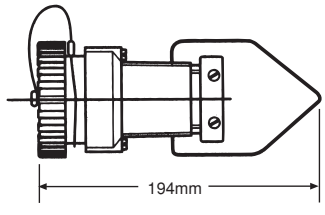
Special Products – Special Rated Plugs and Connectors

Ordering Information: 20 Amp and Australian

Male Plugs

Cat. No.	Dimensions	Rating
223MP2		**20 AMP 250VAC,** 60Hz 2P3W
334MP5	 Australian	**32 AMP Australian Standard 440/500 VAC,** 50Hz 3P4W

Female Connectors

Cat. No.	Dimensions
223FC2	
334FC5	

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Accessories for Plugs & Connectors

Additional Bushing Sizes

Catalog No.	Washer & Bushing I.D.
B16779AR	0.750
B16779BR	0.875
B16779CR	0.620
B16779DR	0.700
B16779ER	1.000
B16779FR	0.800
B16779GR	0.545
B16779HR	0.925

* For 30, 32, 50 & 60A standard devices.

Accessories for Non-Metallic Receptacles[1]

Straight Adapter and Junction Box Shown Assembled.

Junction Box and Straight Adapter[2]

Straight Adapter Catalog No.	Junction Box Catalog No.	Receptacle Rating
SAM50	JM99	30A, 250V
SAM32	JM99	32A, 380/440V (480V)
SAM50	JM99	50A, 250V
SAM60	JM99	60A, 250V
SAM60	JM99	60A, 480V

Angle Adapter and Junction Box Shown Assembled.

Junction Box and Angle Adapter

Angle Adapter Catalog No.	Junction Box Catalog No.	Receptacle Rating
AM50	JM99	30A, 250V
AM32	JM99	32A,380/440V (480V)
AM50	JM99	50A, 250V
AM60	JM99	60A, 250V
AM60	JM99	60A, 480V

Notes:

1. Does not exclude 32 amp metallic receptacles
2. Adapter and Junction Box may differ from photo

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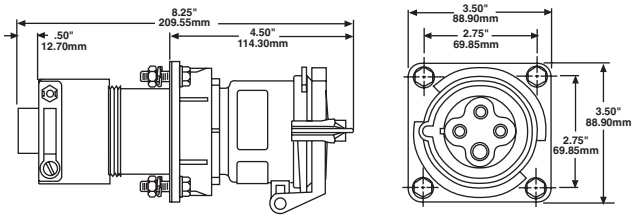
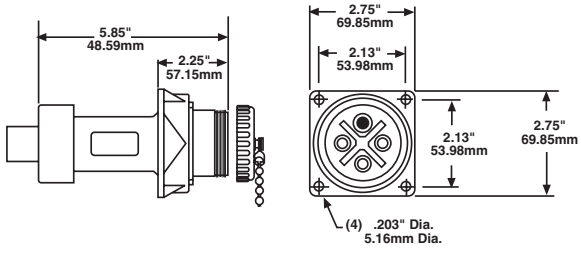
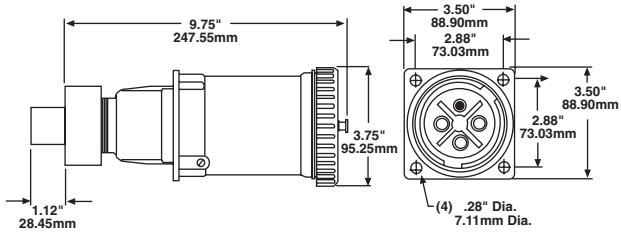
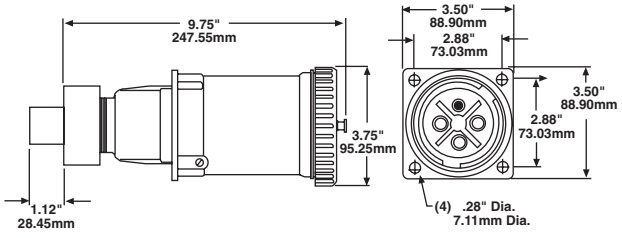
Special Products – Flanged Connectors

Flanged connectors are used in many trailer mount or “underslung” applications where connector needs to be mounted through a bulkhead plate or other fixed position.

Ordering Information

Cat. No.	Dimensions	Rating
333FCVF▲		**32 AMP, 380-440 VAC** 50/60Hz, 3P4W IEC 309-2 (480) VAC-USA)
534FCF▲		**50 AMP, 250 VAC** 60Hz, 3P4W
634FC2FXT		**60 AMP, 250 VAC** 60Hz, 3P4W
634FC4FXTS/0750		**60 AMP, 480 VAC** 60Hz, 3P4W

* Polycarbonate Housing

▲DuraV™ Housing, UL94V-0 Flame rated

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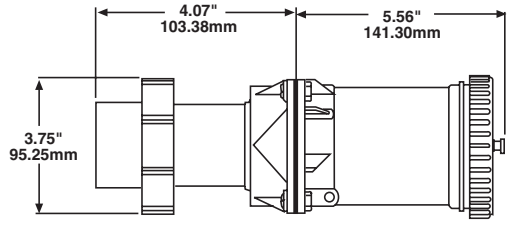
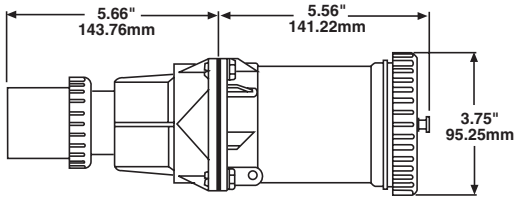
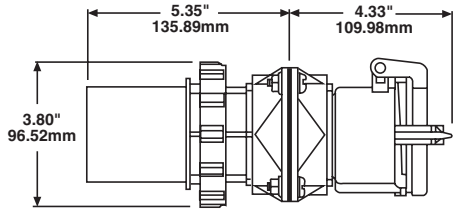
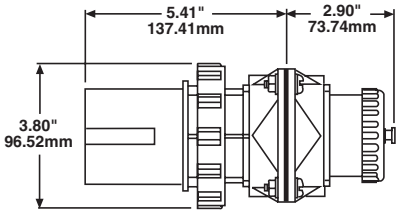
Converter Plugs and Converter Cord Sets

Converter plugs and converter cords facilitate the connection of a plug and receptacle with different ratings. Vessel sharing has become increasingly common, resulting in refrigerated containers with plug configurations that do not match the existing shipboard or port terminal receptacles. The converter plug eliminates the need for time-consuming and expensive temporary change overs when these situations are encountered.

Converter Plugs

Cat. No.	Dimensions	Rating
3260CPV▲		**32 Amp** 380/440V Male Plug → **60 Amp** 480VAC Female Connector
5060CP		**50 Amp** 250VAC Male Plug → **60 Amp** 250VAC Female Connector
6032CP▲		**60 Amp** 250VAC Male Plug → **32 Amp** 380/440VAC Female Connector
6050CP		**60 Amp** 250VAC Male Plug → **50 Amp** 250VAC Female Connector

Note: ▲ DuraV™

Converter Cord Sets

Converter cord sets are also available using a Mipco plug and connector, with two feet (0.6 meters) of suitably rated, four conductor cable. They are available with any plug/connector combination of the same voltage. Contact Tech Support to specify.

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Technical Specifications

Performance – Electrical

Dielectric Voltage Withstand	3,000 Volts
Max. Working Voltage	Minimum creepage distance and minimum clearance per UL 840
Temperature Rise	Max. 30° C temperature rise at full rated current after 50 cycles of overload at 150% rated current at .75pf.

Performance – Mechanical

Impact Resistance	Per UL1682 Paragraph 34
Cord Accommodation	Round portable service cords. 10 standard diameters from .405" to 1.00", custom sizes to spec.
Terminal Identification	In accordance with UL1682
Cable Pull Out Force	In accordance with UL1682
Product Identification	Identification label or molded in name.

Performance – Environmental

Moisture Resistance	Per UL1682 Paragraph 49. Watertight/flap screw cover on receptacle, O-Rings on all pins and sleeves, interiors and plug shell. Watertight even when not engaged.
Flammability	HB or better per UL94 (housing) VØ or better per UL 94 (interior)
Operating Temperatures	Maximum Continuous: 95° C / 203° F Minimum: -29°C / -20°F w/o impact (Polycarbonate) -40°C / -40°F w/o impact (AMTUF™ and DuraV)
Chemicals	Resists standard industrial hydrocarbons, acids, bases and solvents.

Materials

Contact Carrier Interior	Molded arc resistant UL94-V0 thermoset
Housing, Gland Nuts Screw Collar Rings	Amtuf™ (Nylon), DuraV™ or Polycarbonate, High Impact Thermoplastic
O-Rings	Buna-N (Nitrile)
Contacts: Pins & Sleeves	Brass CDA 360
Hinge Pins (Receptacle)	Stainless Steel
Terminals	Brass CDA 360
Terminal Screws Flap Springs Assembly Screws Nuts, Hardware	Stainless Steel or Brass
Bushing Glide Washer	20 Amp - Nylon 30, 50 & 60 Amp - Aluminum
Cable Clamp Bushing	Neoprene or Santoprene

Approvals

Meets requirements for NEMA 4, 4X, & IP 67.

UL & CSA Listed as indicated on previous page.

UL • E138024 & E47956

CSA • LR96445

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Mipco™

Interlocked Reefer Power Outlet

MT433-30F22

MT464-30F22

No One Does it Like Mipco™

Mipco Interlocked Reefer Power Outlets are used extensively in port terminals and shipboard applications to provide a safe, watertight electrical connection for refrigerated containers. They feature a heavy duty, interlocked UL/CSA listed and circuit breaker protected electrical power outlet. This ensures the outlet cannot be switched 'live' until a plug is fully engaged and the actuator rod is pushed to the 'On' position. Pulling the actuator rod to the 'Off' position manually de-energizes the circuit. The circuit de-energizes automatically if the plug is accidentally withdrawn while in the 'On' position. Also, the interlock mechanism 'breaks' the circuit while the pin and sleeve contacts are still engaged. This provides total operator safety and protection against shock hazard while eliminating arcing damage to the plug and receptacle.

The modular design pioneered by Mipco allows for quick, easy installation and maintenance. Mipco engineers designed the Interlocked Reefer Power Outlet for the utmost **safety**, **durability**, and **reliability**.

The Mipco™ Advantage

Safety

- Patented Interlock Mechanism **protects against shock hazard** and cannot be overridden like other designs.
- Plug **cannot be inserted or withdrawn under load.**
- UL 489 listed circuit breaker for **optimum operator and circuit protection.**
- Non-conductive knob is oversize for **safe, easy operation.**

Durability

- Heavy duty ½" diameter stainless steel actuator rod offers **superior resistance to corrosion and abuse.**
- UL 489 listed circuit breaker **is resettable after circuit interruption.**
- Heavy gage stainless steel platform and aluminum receptacle housing **resists corrosion and physical damage.**
- O-ring sealed insulator, contact sleeves, ground pin, interlock actuating pin and actuator rod **insures watertight integrity of wiring compartment, when screw cover or plug is removed.**

Reliability

- Segmented Solid brass contact sleeves with beryllium copper compression springs **minimize heat rise and corrosion.**
- UL 489 listed circuit breaker **provides branch circuit protection per NEC.**

Easy Installation & Service

- Mipco's 'Modular Design' makes installation and maintenance **fast and inexpensive** with easy accessibility to individual parts.
- 4 screw, 3 wire receptacle service.
- One piece interlock mechanism requires **no adjustment and simplifies maintenance.**
- Complete line of **service parts readily available.**
  - Receptacle assembly
  - Circuit breaker assembly
  - Interior assembly
  - Linkage kits
  - Hardware kits
  - Flap cap / Screw cap assemblies

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Mipco™

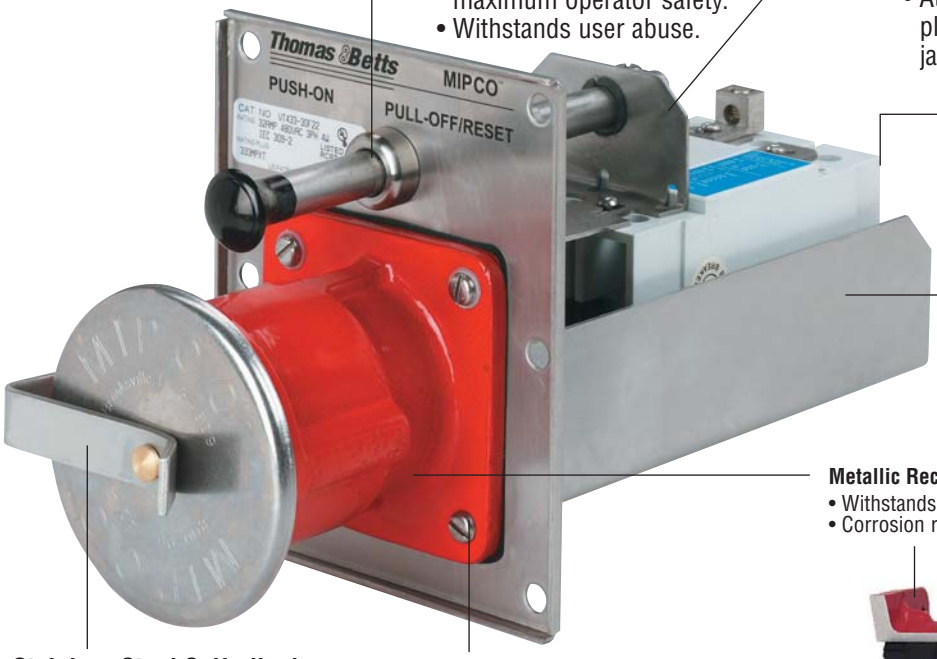
Interlocked Reefer Power Outlet

2 New Compact Frame Choices: *22K AIC or 65K AIC protection*

22K AIC @ 480 Volts

Compact Frame 6-Bolt Interlocked Reffer Power Outlet with Nominal Inrush Current Protection

Cat. No. MT433-30F22 SHOWN



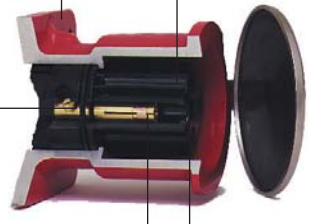
Heavy Duty Actuating Rod
- Superior durability.
- Located away from the receptacle for maximum operator safety.
- Withstands user abuse.

Patented Mechanical Interlock Mechanism
- Protects against shock hazard.
- Eliminates arcing damage.
- Automatically de-energizes the circuit upon plug withdrawal; even if actuating rod is jammed in the "On" position.

UL & CSA 489 Listed 22K AIC Circuit Breaker
- Maximum operator & circuit protection.
- Branch circuit protection per NEC.

Heavy Gauge Stainless Steel Platform
- Maximum durability from user abuse.
- Corrosion resistant.

Metallic Receptacle Housing
- Withstands physical abuse.
- Corrosion resistant.



Ground Pin Actuates Interlocking Mechanism
- Assures grounding integrity with ground pin.
- Receptacle is de-energized upon plug removal. When plug is reinserted, switch can be operated.

Thermoset interiors
- High heat and arc resistant.

Stainless Steel Self-aligning, Flap Cap
- Assures a positive environmental seal.
- Maximum corrosion resistance.
- Withstands user abuse.

Receptacle Mounting Design
- Easy installation and service (4 screws, 3 wires).

O-ring sealed Interiors and Sleeves
- Seals wiring compartment from environment.
- Eliminates accidents and burnouts.

Segmented Contact Sleeves w/ Compression Springs
- Consistent contact pressure.
- Minimizes heat rise & corrosion.
- Self cleaning pins & sleeves for longer life.

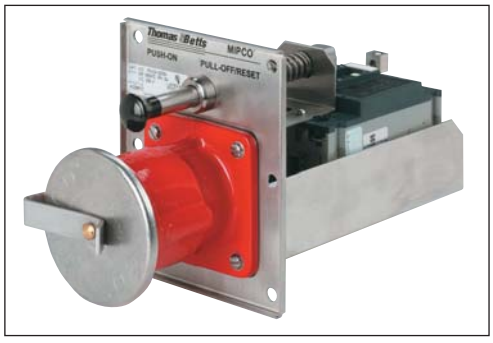
Safe Power By Design –
Best Designed Receptacle In The Industry

65K AIC @ 480 Volts NEW

Compact Frame 6-Bolt Interlocked Reefer Power Outlet with High Inrush Current Protection. Several unique Patent Pending design features.

Now you can get a circuit breaker rated for 65,000 Amps of inrush current at 480 volts with **small, 6-bolt interlocked "standard" reefer power outlet mounting dimensions.**

- **Smaller Enclosures –** Overall size and cost of entire enclosure is significantly reduced.
- **Easy Upgrades** – If inrush (AIC) requirements change, the 65K AIC module can replace 22K modules in existing installations.
- **Mipco Construction Quality & Flexibility:** The 65K and 22K AIC modules share the same design and mounting dimensions.



Catalog Number MT433-30F65 Shown

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Mipco™

Interlocked Reefer Power Outlet

MT432-30F22

MT433-30F22

MT452-50522P

MT464-30F22

(screw cap style shown)

Interlocks with Metallic Receptacle Housings

Interlocked Power Flap Cap	Outlet Cat. No. Screw Cap	Amps	Ratings Voltage	Poles, Wires	Trip Rating ❒ Amps	Mating Plug Cat. No.*
MT432-30F22	**MT432-30S22**	30	250V, 60Hz	3P4W	30	**334MPXT**
MT433-30F22	**MT433-30S22**	32	380/440V 50/60Hz	3P4W	30	**333MPXT**
MT452-50F22	**MT452-50S22**	50	250V, 60Hz	3P4W	50	**534MPXT**
MT462-50F22	**MT462-50S22**	60	250V, 60Hz	3P4W	50	**634MP2XT**
MT464-60F22	**MT464-60S22**	60	480V, 60Hz	3P4W	60	**634MP4XT**

*Note: Mating plugs are sold separately.

❒ Note: Other trip ratings available upon request.

VT432-30S22

VT433-30F22

VT452-50F22P

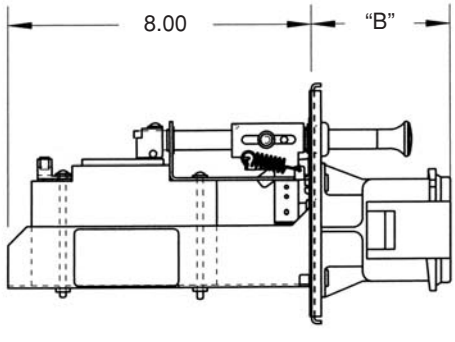
Interlocks with Non-Metallic Receptacle Housings

Interlocked Power Flap Cap	Outlet Cat. No. Screw Cap	Amps	Ratings Voltage	Poles, Wires	Trip Rating ❒ Amps	Mating Plug Cat. No.*
VT432-30F22	**VT432-30S22**	30	250V, 60Hz	3P4W	30	**334MPXT**
VT433-30F22	**VT433-30S22**	32	380/440V 50/60Hz	3P4W	30	**333MPXT**
VT452-50F22	**VT452-50S22**	50	250V, 60Hz	3P4W	50	**534MPXT**
VT462-50F22	**VT462-50S22**	60	250V, 60Hz	3P4W	50	**634MP2XT**
VT464-60F22	**VT464-60S22**	60	480V, 60Hz	3P4W	60	**634MP4XT**

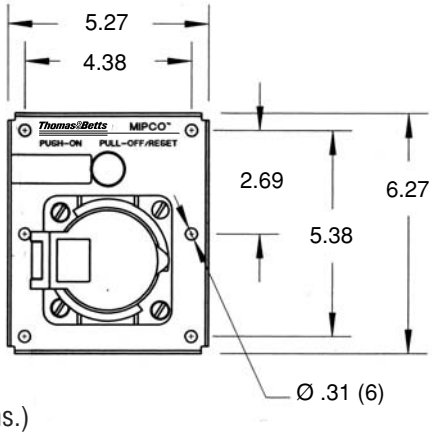
*Note: Mating plugs are sold separately.

❒ Note: Other trip ratings available upon request.

Standard Small Frame Dimensions



Amperage	B
30 & 50A	3.23"
32A	4.00"
60A	5.10"



(Consult factory for large frame dimensions.)
Shown: VT433-30F22

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Mipco™

Interlocked Reefer Power Outlet

Catalog Construction Guide

Mipco interlocked reefer power outlet catalog numbers are easily specified using the guide below.

Options include pilot lamps and/or auxiliary switch construction.

M T 4 33 – 30 F 22 __

Options
P = Pilot Light
PA = Pilot Light w/auxiliary switch

Circuit Breaker In-Rush Current Rating
18 = 18K AIC @480 VAC - Shock Resistant
22 - 22K AIC @480 VAC (65K AIC @ 250 VAC)
65 = 65K AIC @ 480 VAC

Receptacle Cover
F = Flap Cap
S = Screw Cap

Circuit Breaker Trip Rating
30 = 30 Amp
50 = 50 Amp
60 = 60 Amp
Note: Breaker Trip rating will not exceed receptacle rating

Receptacle Rating / Configuration
52 = 50A, 250 VAC, 50/60 Hz
62 = 60A, 250 VAC, 50/60 Hz
64 = 60A, 440/480 VAC, 50/60 Hz

Poles / Wires
4 = 3 pole, 4 wire

Module Style
T = "T" style, center push-rod module

Receptacle Housing Material
M = Metallic:
Copper Free, Cast Aluminum; 32 & 60A modules only
Brass; 30 & 50A modules only
V = Non-Metallic:
DuraV™ – High performance Co-Polymer; 32A modules only
Amtuf™ – High Performance Nylon; 30, 50, & 60A modules only

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Accessories

Wedge Gaskets – Molded neoprene wedge gaskets provide 4° down angle drainage for interlocked outlets; installed behind front plate and are easily installed.

Large Frame Adapter Plate Kit – Stainless steel adapter plate kit allows small frame 6-bolt interlocked outlets to replace large frame 8-bolt outlets. Kit bolts to existing 8-bolt enclosure opening.

Single Gang Enclosures – Copper free cast aluminum for maximum corrosion resistance and durability, these can be ordered separately or complete with interlocked outlet, by using a "1B" prefix with any interlocked outlet catalog number.

1BMT433-30F22

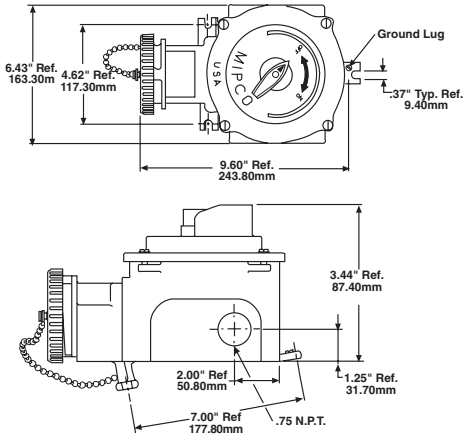
Outlet Frame Size	Cat. No. Single Enclosure	Wedge Gasket Kit	Large Frame Adapter Plate Kit
Small Frame 6 – Bolt	**1255-01R**	**980-50R**	**523R**
Large Frame 8 – Bolt	**1255-11R**	**980-49R**	**523R**

Interlocked Power Outlet Cat. No. Complete with Single Gang Enclosure		Outlet Rating		Mating Plug Cat. No.
Metallic Receptacle Hsg	Non-Metallic Receptacle Hsg	Amps	Voltage	
1BMT432-30F22	**1BVT432-30F22**	30	250V, 60Hz	**334MPXT**
1BMT433-30F22	**1BVT433-30F22**	32	380/440V 50/60Hz	**333MPXT**
1BMT452-50F22	**1BVT452-50F22**	50	250V, 60Hz	**534MPXT**
1BMT462-50F22	**1BVT462-50F22**	60	250V, 60Hz	**634MP2XT**
1BMT464-60F22	**1BVT464-60F22**	60	480V, 60Hz	**634MP4XT**

*Note: Mating plugs are sold separately.

Special Rotary Switch Interlock

Cast Aluminum (or Brass) switched interlocked used for trailer, rail and common feed shipboard applications. Circuit protection normally is upstream of load.

Cat. No.	Dimensions	Rating
SR33341B		**32 AMP, 380-440 VAC** 50/60Hz, 3P4W IEC309-2, 3h (480) VAC-USA)

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Interlocked Reefer Power Outlets

Technical Specifications

Performance – Electrical

Dielectric Voltage Withstand	3,000 Volts
Max. Operating Voltage	480VAC
Circuit Protection	U.L. 489 listed CSA certified circuit breaker.
FLA Interrupting Capacity	Specified breaker rating.
Short Circuit Withstand Rating	22,000 AIC, 65,000 AIC Specified breaker or 18,000 AIC (Shock Resistant).
Operations	>10,000 cycles at rated current.

Performance - Mechanical

Mounting	(6) 5/16" diameter through holes.
Breaker Terminals	Pressure screw lugs (slotted) accepts 14-1/0 AWG wire.
Terminal Identification	In accordance with UL489 and UL1682 A,B,C,G (earth ground) on line side.
Product Identification	External label on face plate.
Operations	>25,000 cycles of operation.

Performance - Environmental

Moisture	Watertight screw cover or spring loaded self aligning flap cap. O-rings on all sleeves, interior, interlock actuating pin and circuit breaker actuator rod bushings. Gasket on receptacle and module flange.
Operating Temperatures	Min. Continuous -20º F (non-enclosed) Max. Continuous +140º F
Chemicals	Resists common industrial hydrocarbons, acids, bases and solvents.
UV Resistance	Polyurethane enamel (32A) and natural metallic finishes provide maximum UV protection.

Materials

Receptacle Housing Metallic	30A/50A - Brass (natural) 32 A - Copper free Aluminum 356-T6 (red epoxy powder coated) 60A - Copper free Aluminum 356-T6 (natural).
Non-Metallic	30A/50A & 60A AMTUF ™ 32A – DURAV ™
Interior	Molded arc resistant thermoset phenolic (U.L. 94-V0 flame rating).
Contact Sleeves	Brass with beryllium copper compression springs.
Terminal Screws	Brass, Slotted
O-Rings	Buna-N (Nitrile)
Gaskets	Neoprene
Mounting Platform	Heavy gauge stainless steel welded construction.
Actuator Rod	1/2 inch diameter solid stainless steel. Heavy duty non-conductive impact resistant plastic knob.
Ground Lug	(Aluminum) Terminal screw (slotted) accepts up to #2 AWG wire.
Interlock Mechanism	Sealed self lubricating thermoplastic.
Flap Cap	12 gauge stainless steel, gasketed cover.
Screw Cap	High impact plastic, gasketed
Washers	Nylon
Springs, Fasteners	Stainless Steel

Approvals

Underwriters Laboratory (U.L.) – Sections 489, 1682 and 1686.

CSA Section – C22.2–182.1

Federal Department of Transportation – Federal Register volume 47, number 68, subpart 11.79 **United States Coast Guard (USCG)**

International Electro-Technical Commission (IEC) – 32 Amp devices conform to IEC 309-1 and 309-2

International Standards Organization (ISO) – ISO 1496/2, Annex 1

UL • E47955 CSA • LR96445

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Mipco™

Interlocked Reefer Power Outlets

Engineering Specifications

1.0 SCOPE

1.1 This document covers pin and sleeve marine/industrial grade, reefer power outlet assemblies. Useable in dry, damp, wet, outdoor marine locations for providing electrical power to refrigerated containers. Assemblies shall be UL listed with enclosures incorporating interlocked reefer power outlets in a modular multi-gang arrangement. Devices are factory wired to a UL recognized power distribution block and rated 30, 32, 50, and/or 60 amps at 250 or 480 VAC, 50 – 60 Hz. Devices are also rated for continuous use in temperatures from -20 degrees to +140 degrees F. These devices must provide internal environmental seals for marine and extreme wet applications, and are to be mechanically interlocked.

1.2 All assemblies specified shall be manufactured by Mipco as complete assemblies and shall be marked as stated.

2.0 PRODUCT CLASSIFICATION

ENCLOSURES:

2.1 **Construction** – All enclosures shall be specified either 12 or 14 gauge stainless steel, and shall conform to NEMA 4X requirements for watertight, dust-tight, and corrosion resistance.

2.2 **Access Panel** – Each enclosure shall provide an access panel designed to allow complete wiring compartment accessibility. Bolted plate or hinged panel to be specified.

2.3 **Power Distribution Block** – All interlocked reefer power outlet assemblies shall be factory wired to a U.L. recognized power distribution block. Line lugs shall accommodate a range of wire sizes compatible with the total amperage rating of all enclosed receptacles

RECEPTACLES

2.4 **Interlocked Receptacles** – The receptacles shall be of a modular design, mechanically interlocked to allow the circuit to be energized only after a mating plug is fully inserted into the receptacle and the actuating rod is pushed forward. All interlocked receptacles shall allow the de-energizing of the circuit before mated contacts are disengaged upon plug removal. The mounting dimensions shall be the same for interlocked receptacles with a high (65K) or nominal (greater than or equal to 20K) inrush current circuit breaker to allow for future upgrades.

2.5 **Grounding** – The grounding of the device shall be accomplished through a separate ground (earth) that will make first and break last. The ground pole shall be bonded to a UL recognized ground block labeled for connection to the ground conductor.

* All non-current carrying metallic components must be grounded to insure complete system grounding.

2.6 **Housings** – Receptacle housings shall be metallic, copper free aluminum or thermoplastic with performance equal to or greater than DuraV' or AMTUF™, and have a flame rating no less than UL94 V0.

2.7 **Interiors** – Receptacle interiors must be molded thermoset, UL94 V0 and be replaceable for ease of maintenance.

2.8 **Contact Sleeves** – Quad-slit brass contact sleeves shall have contact pressure springs of electromotively similar material to maintain consistent contact pressure between sleeves and mating male pins and prevent galvanic corrosion.

2.9 **Environmental Seals** – Each device must have an environmental seal or O-ring around all interiors and around each sleeve to prevent water and contaminants from entering the wiring compartment. The seals shall provide waterproof capability if plug or screw cap are removed.

2.10 **Circuit Protection** – Each interlocked receptacle must be protected by a molded cased, thermal-magnetic type, UL 489 listed circuit breaker. The circuit breaker must also comply with NEC Articles 240 and 430 for branch circuit protection.

2.10a **High Inrush Current Protection Requirements** – Circuit breaker shall have a minimum 65,000 amp interrupting capacity.

2.10b **Nominal Inrush Current Protection Requirements** – Circuit breaker shall have a minimum (18,000 high shock) 22,000 amp interrupting capacity.

2.11 **Flap Cover or Screw Cover Option** – Flap cover option must provide weather-tight capability to the exposed contacts by utilizing a spring actuated self closing flap. Watertight capability shall be obtained by using a gasketed screw cap.

3.0 DESIGN AND WIRING REQUIREMENTS

3.1 **Wiring** – All enclosure assemblies must be factory wired to conform to guidelines stated in the NEC for wire sizing, Table 310-16 and wire bending space, Article 373-6. Wiring of individual interlocked reefer outlets must allow for the removal/replacement without opening the access door.

3.2 **Conduit Entry** – All assemblies shall include a conduit entrance with an aluminum conduit hub; size and location to be specified.

4.0 APPLICABLE COMPLIANCES

4.1 **Underwriters Laboratories (UL)** – The enclosure assemblies specified herein shall be listed in applicable sections of UL Standards 489, 1682 and 1686.

4.2 **Canadian Standard Association (CSA)** – The devices shall be listed in the applicable sections of CSA C22.2-182.1.

4.3 **American Bureau of Shipping (ABS)**

4.4 Federal Department of Transportation – shall comply with Federal Register volume 47, number 68, subpart 11.79 and the United States Coast Guard (USCG).

4.5 **International Electro-Technical Commission (IEC)** – The 32 ampere devices specified shall conform to IEC 309-1, and IEC 309-2, EN60309.

4.6 **International Standards Organization (ISO)** – The 32 ampere devices specified shall conform to ISO 1496/2, Annex L.

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Mipco™

Multi-Gang Enclosure Systems

Pedestal Mount

Horizontal Mount

Bunker Mount

Horizontal Mount

Vertical Mount

Mipco…A World of Applications

Mipco Multi-gang Enclosures offer maximum application flexibility to suit all installation requirements. For ports/terminals, railcars, trailer chassis manufacturers, maintenance facilities or shipboard use, our modular design concept has become the industry standard. All enclosures are manufactured to meet the industry's and Mipco's highest standards for safety, durability and reliability.

Safety

- **Operator safe** with U.L. listings and C.S.A. approvals for up to any number of interlocked reefer power outlets.

Durability

- **Watertight, dust tight and corrosion resistant,** continuous seam welded 14 gauge stainless steel enclosures (12 gauge available). Conforms to NEMA 4X requirements.

Reliability

- **Minimize equipment downtime** with access panels designed for complete wiring compartment accessibility. Bolted or hinged covers with padlock latches available.
- **Reliable** Mipco interlocked reefer power outlets installed in enclosures are shipped contractor-ready: pre-wired to terminal blocks with one entry and termination for easy connection to main feeder cable.

Standard Enclosures

Standard assemblies are available for 2,3,4,5 and 6 gang enclosures that can be manufactured to meet your specific needs. Standard bunker, horizontal, vertical, and pedestal mounted enclosure layouts are shown on following pages.

Contact Mipco for our "Mipco standard enclosure assembly engineering and specification guide" to design multi-gang enclosures quickly and easily shown on following pages. Options available include pilot lights for visual power indication and monitoring sockets used for remote sensing, defrost or other temperature control monitoring.

Custom Enclosures

Custom multi-gang mounting arrangements or totally custom enclosures are available, for vertical, horizontal, pole, bunker, wall pedestal or any other installation. Consult Mipco for assistance in planning for your installation. Engineering drawings of various configurations with exact specifications are available upon request.

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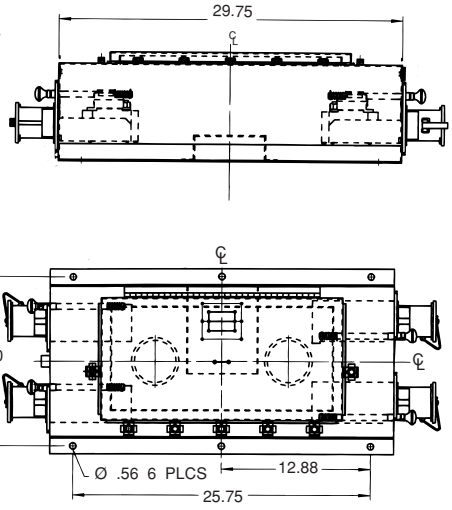
Mipco™ Standard "Bunker" Mount Enclosure Assembly

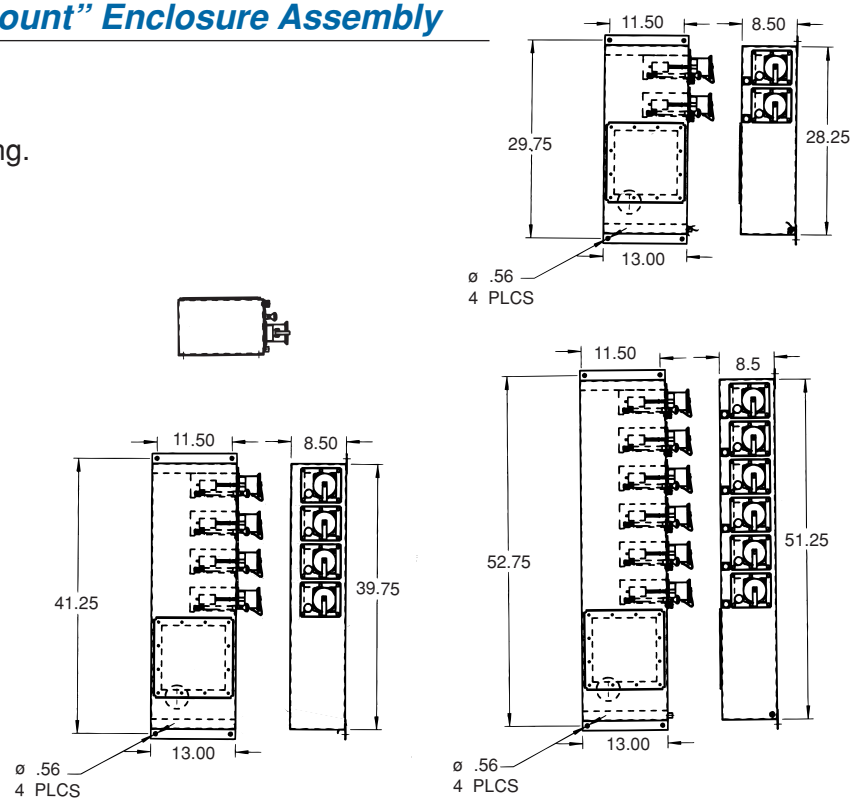
- Smaller Size, Bigger Performance: Overall smaller units mean less facilities investment in concrete, etc., plus higher outlet densities.
- Low-profile, protected by concrete "bunkers".
- Trucking or land-based terminals.
- Contact Mipco for Specification Guide.



Catalog number BØ4M2F3BR2F1XX shown. Interlocked reefer power outlet standard: MT433-30F22.

Mipco™ Standard "Horizontal Mount" Enclosure Assembly

- Low-profile.
- Land based terminal installations.
- Vertical surface for ship-board mounting.



Catalog number HØ6M2F3BF1C1XX (6-GANG), HA4M2F3BF1C1XX (4-GANG), and HA2M2F3BF1C1XX (2-GANG) shown. Interlocked reefer power outlet used: MT433-30F22.

All systems customizable with many options.

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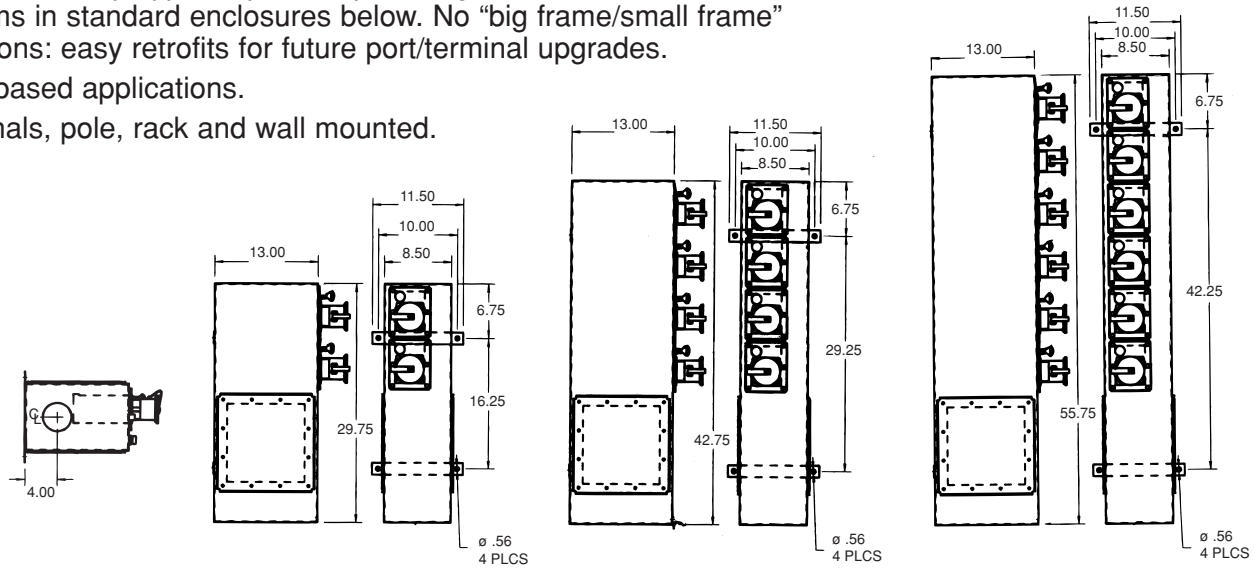
Mipco™ Standard "Vertical Mount" Enclosure Assembly

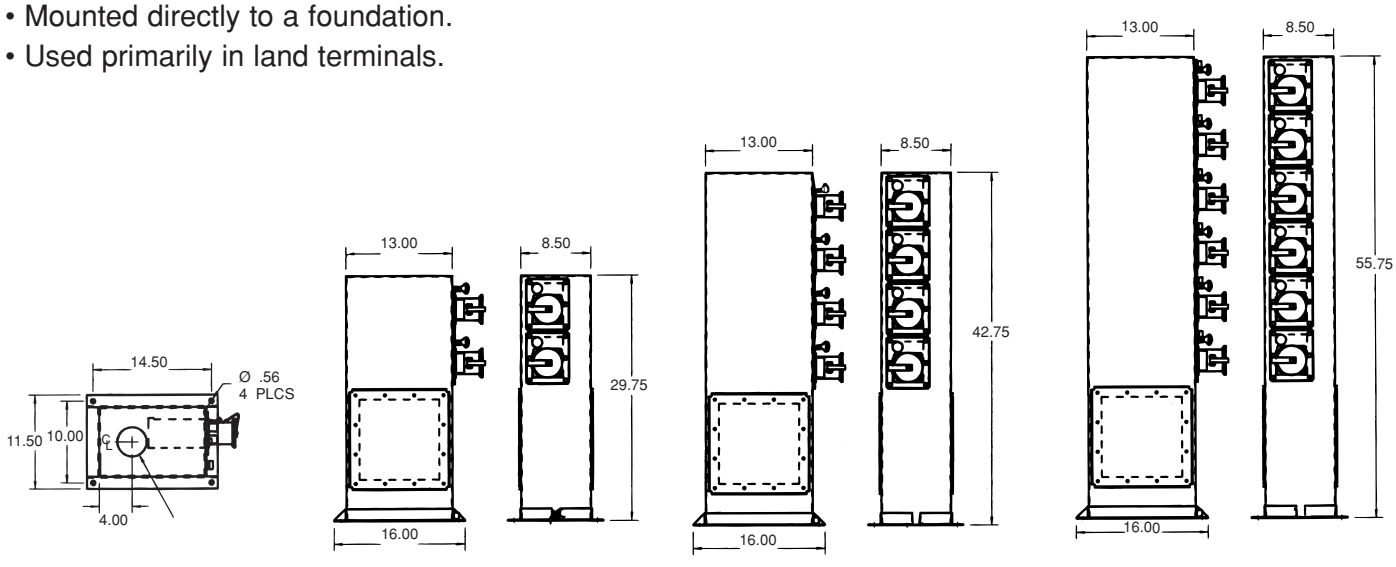
- Same Size, Any Type: Mipco-unique designs mean 18K, 22K or 65KAIC systems in standard enclosures below. No "big frame/small frame" questions: easy retrofits for future port/terminal upgrades.
- Land-based applications.
- Terminals, pole, rack and wall mounted.



Catalog number VØ6M2F3BC1D1XX (6-gang), VA4M2F3BC1D1XX (4-GANG), AND VA2M2F3BC1D1XX (2-GANG) shown. Interlocked reefer power outlet standard: MT433-30F22.

Mipco™ Standard "Pedestal Mount" Enclosure Assembly

- Mounted directly to a foundation.
- Used primarily in land terminals.



Catalog number PØ6M2F3BP1F1XX (6-gang), PØ4M2F3BP1F1XX (4-gang), and PØ2M2F3BP1F1XX (2-gang) shown. Interlocked reefer power outlet standard: MT433-30F22.

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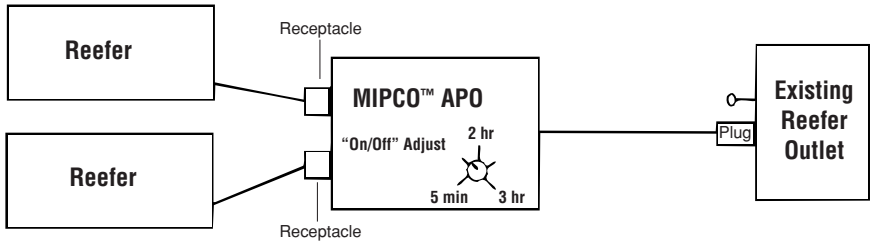
Alternating Power Outlets (APO) – General Information

Service Application

The Alternating Power Outlet (APO) is a portable power distribution box which provides an alternative means of powering reefer or tank containers when there is a shortage of outlets. The Mipco™ APO is designed for outdoor use and is available with any of the standard reefer electrical configurations from 30-60 Amps and 250-480 Volts. The APO is comprised of an enclosure with two female fixed receptacles and a single male plug attached with a short length of flexible cable. When the connections are secured and the power is engaged then the two female receptacles are energized on an alternating basis, with the on/off time interval set by the user to be any time between 5 minutes and three hours. Both container plugs remain permanently connected to the APO but only one receptacle is energized at any given time. The upstream circuit is not overloaded, which can occur with Y-cords or common distribution boxes.

WIRING DIAGRAM:



Features

- Dead Front construction and interlocked cover for maximum operator safety.
- Individual pilot lights to identify "live" receptacle.
- Pad-lockable cover for maximum safety.
- Internally adjustable solid-state timer(s) with 5 minutes to 3 hours "on" time per outlet.
- Handle design provides integral cord storage and ease of portability.
- Anti-skid feet minimize shifting and elevate enclosure above standing water.
- NEMA 4X corrosion resistant enclosure.

Optional Features (Consult Factory)

- Dual adjustment capability to individually set "On" time of each outlet.
- Pilot lights with integral momentary push button for manual operation of outlets.
- Other customized features to meet specific customer requirements available upon request:
- Timing Range – Cable Length – Inlet vs. Plug – Electrical Interface

Ordering Information

Alternating Power Outlet Cat. No.	Rating	Standard Parts Included Receptacles (2)	Plug
3034APO	30A/250VAC	3034FRXTS	334MPXT
3334APO	32A/480VAC	3334FRVF	333MPXT
5034APO	50A/250VAC	5034FRXTS	534MPXT
6234APO	60A/250VAC	6234FRXTS	634MP2XT
6434APO	60A/480VAC	6434FRXTS	634MP4XT

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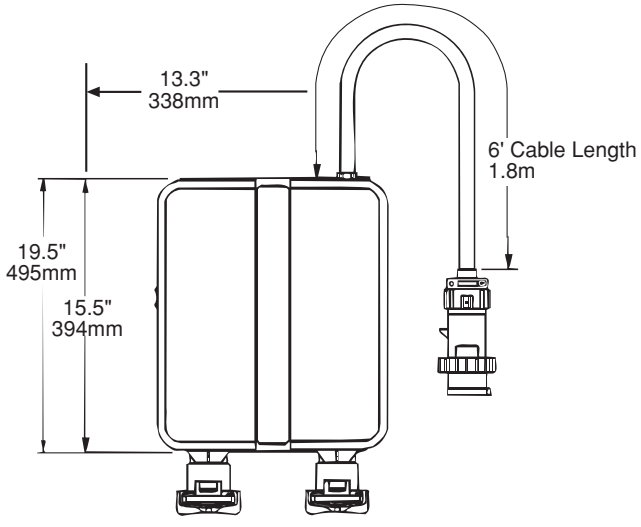
Specifications

Performance – Electrical

Style	3 Pole, 4 Wire
Rating	30 Amp 250 VAC Plug & Receptacle 32 Amp 480 VAC Plug & Receptacle CEE-17 3-h 50 Amp 250 VAC Plug & Receptacle 60 Amp 250 VAC Plug & Receptacle 60 Amp 480 VAC Plug & Receptacle
Transformer	50 VA Class A, Fused
Contactors	30, 50, or 60 Amp rating, 480 or 250 VAC heavy duty coil

Performance – Mechanical

Terminals	Receptacle – Female Contact Sleeves (4), Copper Alloy Plug – Male Pins (4), Copper Alloy
Plug Terminal Connection Wire Hole Diameter	32A, 480VAC – .187" (4.75mm) 50A, 250VAC – .203" (5.16mm) 60A, 250VAC – .250" (6.35mm) 60A, 480VAC – .250" (6.35mm)
Cable	Standard Lenght 6' 32A, 480VAC – #8/4 SO 50A, 250VAC – #6/4 SO 60A 250VAC – #4/4 SO 60A 480VAC – #4/4 SO
Pilot Light	Green recessed lights (2)
Timer	Solid state encapsulated. Range 5 min. to 180 min.
Weight	26 lbs. (11.8 kg) Approximately



Performance – Environmental

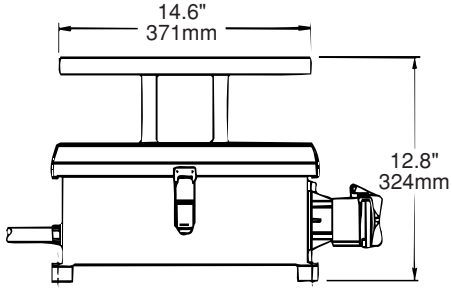
Moisture Resistance	Per UL1682 Paragraph 49. Watertight/flap screw cover on receptacle, O-rings on all pins and sleeves, interiors and plug shell. Watertight even when not engaged.
Flammability	HB or better per UL94
Operating Temperatures	Maximum Continuous: 95°C / 203°F Minimum: -29°C / -20°F w/o impact
Chemicals	Resists standard industrial hydrocarbons, acids, bases and solvents.
Enclosure	Meets requirements for NEMA 4, 4X, 6 & IP67

Materials

Enclosure	Non-Metallic NEMA 4X fiberglass reinforced polyester
Handle Assembly	Aluminum (gray epoxy powder coated)
Receptacle Housing	Amtuf™ Molded Polyamide
Plug Housing	Amtuf™ Molded Polyamide
External Fasteners	Stainless Steel
Gaskets	Neoprene
Mounting Feet	Rubber (Neoprene)
Latch	Stainless Steel (Padlockable)

Approvals

UL • E108856 CSA • E108856



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